AMENDMENT II
TO
CHIP FORMAT PRINTER SPECIFICATION
DATED 7 JULY 1965 and
AMENDMENT I
DATED 15 OCTOBER 1965

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Prepared by [redacted]

The following is a list of changes to the 7 July 1965 Specification and 15 October 1965 Specification Amendment I for the Chip Format Printer.

Paragraph 1.1(e) - Specification

This paragraph calls for an air mounted vibration isolator system. Because of some serious shortcoming of these mounts, cable isolators were installed in their place.

Delete: e (1) An Air-Mounted Vibration System
Add: e (1) Cable Isolators

Paragraph 2.2.1 - Specification and 4.3 - Amendment

Delete 0.003 inches to 0.012 inches. Add 0.003 to 0.0075 in their place.

Paragraph 2.3.1 - Specification

Delete ninety (90) and add eighty (80).

Paragraphs 2.3.1.1 and 2.3.1.2 and 2.3.1.3 and 2.4.1 - Specification

An additional character has been added to the tape format raising the total number of control characters to 25. This character will be on Information Separator (code S_7) between the last word of Number of Prints and Start of Message. Also, adjacent messages on the input tape should be separated by a series of spaces for leader. Therefore, delete all references to 24 and add 25 in their place.

Paragraph 2.4.2(a) - Specification

This paragraph calls out a design approach that was not used in the unit. Machine readable is now produced by a rotating font. Also, character generation command information cannot be taken directly from the input tape, but must be stored in and retrieved from a digital memory. Therefore, delete A.S.A. and change to read A.S.C.I.I., and delete the two last sentences in (a) starting with, "It will..... .....to print."

Paragraph 2.4.2(b) - Specification

Delete the first sentence, "The alpha-numerical.....font." Add the first sentence, "The alpha-numerical display and the digital display will be generated by utilization of a constantly rotating font."

Paragraph 2.4.3 - Specification

Delete the last two sentences starting with, "The symbols.....input tape."

Paragraph 2.6.1 - Specification

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This paragraph calls out a one run capability of 36. Rework of the [redacted] processing magazine will reduce this value to 34 minimum. Therefore, delete 36 wherever it appears and add 34 minimum.

Paragraph 2.7.3 - Specification

Add to first sentence after the last word travel "when tested with .0054 ± .0003 inch-thick film."

Paragraph 2.7.4 - Specification and 4.2.1 - Amendment

Delete: 0.1mm.
Add: 0.2mm.

Paragraph 2.7.5 - Specification and 4.2.1 - Amendment

Delete: 1/10 of 1 degree.
Add: 0.2 degrees.

Paragraph 2.7.8 - Specification

Delete: .10 of a foot.
Add: 0.2 ft.

Paragraph 2.7.10 - Specification

Delete the words "six digit" wherever they appear and add "five digit" in their place.

Paragraph 2.8.1(b) - Specification

Delete: .200 of an inch.
Add: 0.250 of an inch in diameter.

Paragraph 2.8.1(c) - Specification

Delete:	one-half stop	Delete:	± 1 1/2 stops
Add:	one stop	Add:	± 3 stops

Paragraph 2.10.4 - Specification

Delete:	105
Add:	108

Paragraph 2.11.3 - Specification

Delete:	"cards"
Add:	"diagrams"

Paragraph 6.1.1 - Specification

Delete "along with" and add after drawings "consisting of only major assemblies and".

Paragraph 1.3 - Amendment

Delete "security classification and etcetera."

Paragraph 4.2.1 - Amendment

Add after ± .3mm "when tested with .0054 ± .0003 inch-thick film."

Paragraph 4.3.1.3 - Amendment

Delete:	1/2 step
Add:	1 step

Under Note, delete 1/4 and add 2/3.

General

In the event raw input chips without anti inhalation backing are used in the unit with the liquid gate operating, a variation in density may be experienced around the border of the chip to a depth of approximately 1/4 inch.

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AMENDMENT I

SPECIFICATION OF A

CHIP FORMAT PRINTER

15 October 1965

Log No. 105-X4

Copy No. 4

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This is Amendment I to Specification of a Chip Format Printer dated 7 July 1965 consisting of the changes listed below and the Acceptance Test Specifications.

Listed below are those changes discussed during negotiations of the 105 contract. These changes are to be submitted as per our agreement.

The following changes are to be made in the document entitled, "Specification of a Chip Format Printer," dated 7 July 1965.

On Page 30, first sentence:

Change Par. 3.1 to read: The Contractor shall prepare and submit to the Project Monitor for approval a detailed test plan approximately sixty (60) days prior to the completion of the instrument. This test plan will be based upon the Acceptance Test specification and will determine conformance to this specification. The

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Project Monitor reserves the right to modify the test plan to assure complete testing in conformance with the Acceptance Test specification.

Item 6.1.1, Manufacturing Drawings. Delete paragraph completely and insert:

6.1.1 A set of drawings consisting only of major assembly drawings, wiring schematics and a drawing index shall be furnished as an end item. These drawings shall conform to good [redacted] commercial STATOTHR practices.

Item 8.1 and Item 8.2, Project Monitor's Office, shall be notified in writing of delivery schedule at least fifteen (15) days before actual delivery.

ACCEPTANCE TEST SPECIFICATIONS

1. SCOPE

1.1 Applicability - This specification defines the tests to be performed on the Chip Format Printer, Unit Number 105, for the

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verification of operational performance, prior to final acceptance by the Customer.

1.2 Purpose - These tests will constitute all of those items of inspection and testing to be performed on the equipment to insure that all the required functions are performed to specification and that the quality of material and workmanship is in compliance

STATOTHR with the requirements of [redacted] Corporation's specification entitled, "Specification of a Chip Format Printer," dated 7 July 1965.

1.3 Function of a Chip Format Printer - The prime function of the Chip Format Printer (C. F. P.) is to produce standard 4 X 5 chips by direct contact from original input material, upon which exists selected high resolution photographic detail, which has been properly oriented and phased, to definite fiducial control marks. The chip will also contain certain security control classifications and a generated control data block with both an alpha-numerical and a digital display.

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The input material is to be 70mm to 9-1/2" film of varying thickness from .002" to standard .0075" film.

Operational control shall be primarily by paper tape input with the exception of the desired selection of frame which is to be manual. However, automatic control has an override which allows selections of; number of prints, ~~security classification, etcetera.~~ A digital display and manual controls for positioning to any desired point are also included.

The unit will incorporate a liquid gate to reduce existing film surface scratches from being printed on the output film.

The printer will include a character generator to lay down up to 80 alpha-numerical characters and up to 128-eight level ASA code characters.

The output chip after printing will be placed in a chip holder and the chip holder, in turn, positioned in a chip holder magazine which may be quickly removed for processing.

Adequate venting of toxic solutions shall be provided.

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2. APPLICABLE DOCUMENTS SPECIFICATIONS

2.1 The following documents of the issue in effect on this designated date form a part of this specification to the extent specified herein:

(a) Specification of a Chip Format Printer, 7 July 1965

(b) Report No. 105-65-1, 30 January 1965 Final Report for the Study Phase I, Project 105

3. TEST CONDITIONS

3.1 Climatic Test Conditions - During the acceptance tests, the equipment shall be in a temperature controlled environment within the limits of 20°C to 25°C. The relative humidity in the area shall be controlled, if necessary, to be between 30% to 60% throughout the tests.

3.2 Mechanical Test Conditions - The equipment shall be tested in a room where adequate dust prevention has been assured.

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3.3 Electrical Test Conditions - Electrical power to the equipment shall be 208 volts ±5 volts, 60 cycles, 3 phase.

4. FUNCTIONAL TESTS

4.1 Operating Controls - Each control button, switch and indicator which bears on the operation of the equipment shall be tested to determine that it performs its assigned function.

4.2 Pre-Position - The unit shall be loaded with test input film and the film positioned on the fiducial center. Emulsion shall be up. The following test shall be performed with the input tape. All of the below items are displayed either on the console or presented on the film as outputs during later tests.

4.2.1 Reading of punch paper tape data shall be demonstrated.

Readout of the "y", "x" and azimuth values shall be demonstrated and final position of the test input film shall be verified to be correct in azimuth to within ~~1/10 of 1 degree~~ 0.2 degrees, in

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when tested with .0054 ± .0003 inch thick film

the "x" position to within ±. 3mm and in the "y" position to within

Amend II 0.2mm ~~1mm.~~ The above positions to be correct to the center of the final printing area. Actual test for these accuracies are to be accomplished as explained in Paragraph 4. 3. 4.

While the above is being positioned the visual display shall be monitored as a check against final position.

Readout of the Security Classification Positioner shall be demonstrated.

Readout of the number of prints shall be demonstrated and check on the visual display indicator.

Readout of the various character generator alpha-numerical and digital data shall be demonstrated.

Indicators shall show correct parity check. At completion of alpha-numerical and digital readouts.

Film properly spliced will be transported to illustrate that the unit can handle splices.

4. 3 Output Chip Operation - The chip magazine shall be supplied with a sufficient amount of 4 x 5 raw stock of between . 003 - Amend II .0075 ~~.012~~ thickness.

The chip holder compartment shall be filled with chip holders. A chip cassette to receive the finished chip and chip holder shall be in place.

After having selected the area to be reproduced by tape input, the magazine shall be positioned for printing. The selected number of copies required shall be set and the film format mask shall be in place.

4.3.1 Automatic Exposure Control System - A series of exposures shall be made to check out the Automatic Exposure Control System. Correct exposure shall be defined as that exposure which produces the most complete undistorted grey scale possible.

Note: A factory adjustment can be made, and set to establish all of the 3 tests listed below.

4.3.1.1 With suitable input targets the normal exposure control shall establish correct exposure. Based upon a flat negative, a normal negative and a high contrast negative.

4.3.1.2 With a clear input film and an exposed area of

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approximately 1/4 inch the Enlarged Automatic Exposure Control System shall be tested in the same way.

4.3.1.3 Selective - with either or both of the above, all seven one ~~(7)~~ step exposure variations shall be tested utilizing a step wedge as an input.

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Note: For purposes of this test, one (1) individual step in the center of the gray scale shall be selected and the resultant exposure changes be established by reading this density change only. Accuracy shall be determined to be within 2/3 ~~(1/4)~~ of a stop.

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4.3.2 Magazine Operation - The tape input shall be started to read in the alpha-numerical and digital display and the unit will be energized to produce a selected number of prints. Resolution test targets and format positioning targets are to be utilized as test input. The liquid gate shall be in operation during all tests.

The resultant output films are to be utilized to establish the specification requirements of the following items: 4.3.3 Resolution, 4.3.4 Positioning Accuracy, 4.3.5 Data Recording and 4.3.6 General Print Quality.

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4.3.3 Resolution - Where the final film to be utilized has not as yet been firmly established. Resolution acceptance shall be established as follows: a resolution target shall be correctly exposed and the film developed to the film manufacturer's recommendation. The resultant resolution shall be to within 12% or one $\sqrt{2}^{6}$ target from that of the film manufacturer's published resolution, but need not be greater than 400 lines/mm.

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The test target shall be of a multiple test target type and resolution shall be read in each of the four corners and the center of the output chip.

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4.3.4 Positioning Accuracy - An input test target consisting of a long cross will be established within 25-inches of a center mark. This input test target shall be placed in the unit. A tape input consisting of the exact dimensions given between the two cross hairs as x and y coordinates and with a supplied rotation angle shall be supplied to the tape reader.

The printer shall be positioned over one of the cross hairs and the tape allowed to position the film to the second set of cross hairs. At the completion of this operation an exposure shall

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be made and the resultant position accuracy checked on the output film with reference to the established fiducial marks applied to the finished format. Both format sizes shall be checked for accuracy.

4.3.5 Data Recording - Sufficient exposures shall be made to generate at least one of each of forty characters. The characters shall be readable, not run into one another and shall be easily discernible.

The digital display shall be clean and symmetrical and each edge shall be defined sharply and smoothly to within .003 of an inch.

4.3.6 General Print Quality - Various chip outputs shall be carefully examined to illustrate the lack of damage caused in the chip printer.

Special care shall be given to look for contact marking, Newton rings, scratches, liquid drying, etc.

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4.3.7 Illumination - A test for even illumination shall be performed by exposing a chip without an input film in the film gate. The resultant density shall be maintained between .1 to .3 and illumination shall not vary by more than 20% across the film area.

5. RELIABILITY

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5.1 A log shall be kept during all Q. C. testing along with the actual operation time on the unit.

This log shall serve to show continuous operation for not less than ten (10) consecutive hours without malfunction or breakdown as part of the pre-shipment test.

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This log along with the entire Q. C. Testing Program and the general design shall serve to illustrate the design goal of 5,000 cumulative hours without degradation of performance. No other testing will be done to demonstrate the design goal.

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SPECIFICATION OF A

CHIP FORMAT PRINTER

7 July 1965

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PERFORMANCE REQUIREMENTS FOR SPECIFIC FORMAT CHIP PRINTER

1. INTRODUCTION

This general specification covers the performance requirements for the Specific Format Chip Printer Console, a step and repeat printer, capable of producing duplicate exposures of specific formats containing the highest possible quality resolution and acutance.

Incorporated, herein, are those requirements which have been included in previous specifications and in resultant reports from tests, breadboards, and design studies. This specification, therefore, supersedes all previous general requirements and becomes the governing specification for Phase II of this Program.

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1.1 Description

Engineer, furnish, and install a Specific Format Chip Printer (S. F. C. P.) Console, with associated electronics, consisting of the following:

a. (1) Film Chip Cassette

b. (1) Print Magazine

c. (1) Print Console Section

d. (1) Electronics Console Section

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e. (1) ~~An Air-Mounted Vibration System~~ CABLE ISOLATORS

f. (1) TELETYPEWRITER, G. F. E.

Items a through f form the Specific Format Chip Printer Console assembly.

Installation shall be considered complete when the tests, outlined in Section 3, have been processed through the S. F. C. P. and witnessed by the procuring activity.

2. REQUIREMENTS

2.1 Input Materials

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2.1.1 Input Film. Negative roll film, either one or two rolls of 70 mm or 5-inch; or one roll of 9-1/2 inch capacity up to 500 foot spool size. Formats to be from 70 mm through 9-1/2 inches wide by 50 inches long. Also, 70 mm through 9-1/2 inches, roll negatives continuous strip type. Thickness variances from thin base (.002 inch) through heavy base (.0075 inch).

2.2 Output Materials

2.2.1 Size. 4.937 ± .03 inches by 3.92 ± .015 inches, ranging in thickness from .003 to .0075 ~~.012~~, standard cut chip positive film of specific format containing:

Amend II

a. Contact Image Area

b. Security Classification

c. Human-Machine Readable Code Specification, as Illustrated in Figure 1.

2.2.2 The contact image area shall be two specific sizes:

a. 80 mm x 116 mm b. 55 mm x 116 mm

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2.3 Input Information

2.3.1 Auxiliary data to be printed on the format shall be: security classification (two locations), an identifying accession number consisting of up to ninety ~~(90)~~ 80 alpha-numeric characters, and up to one hundred and twenty-eight machine readable characters. The alpha-numeric information shall appear in the same order as the machine code information. The carriage return, line feed signals which will be produced, on the input tape, by the computer will not be printed out onto the output chip. The American Standard Code with an even parity convention shall be used as the input and output machine code configuration.

paper tape or 80 ?

Amend B

2.3.1.1 The input information shall be by an internal code generator operated from an external keyboard or paper tape input and shall consist of the following character identifies:

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			Example
Information Separator	-	One Character	-
Y Value	-	Five Characters	-1258
Information Separator	-	One Character	-
Azimuth Value	-	Four Characters	1692
Information Separator	-	One Character	-
X Value	-	*Six Characters	+26371
Information Separator	-	One Character	-
Security Classification	-	Two Characters	11
Information Separator	-	~~One~~ Two Character	-
Number of Prints	-	Two Characters	12

Control Section of Tape

25 Amend II

*Although 5 characters were requested, 6 characters are required in order to position the X axis to within 0.1 mm for the case of the 50 inch panoramic film.

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			Example
Start of Message	-	One Character	-
Installation Identifier	-	Two Characters	10
Mission Identifier	-	Eleven Characters	903912A1206
Date	-	Six Characters	181263
Enlargement Factor	-	Two Characters	14
Geographic Coordinates	-	Eleven Characters	6147N10132E
Photo Frame Reference	-	Ten Characters	+2634-1258
Orientation	-	Four Characters	1693
Spaces Interspaced Into The Above Data	-	Ten Characters	-
End of Address (EOA)	-	One Character	-
Machine Readable Code	-	Sixty-Eight Chars.	-
End of Transmission (EOT)	-	One Character	-
MPC Parity Check	-	One Character	7
MPC Parity Check	-	One Character	5
Stop Code (DC4)	-	One Character	-

Print Information Section of Tape

Note: Carriage Return and Line Feed symbols will be supplied as needed by the computer.

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TOTAL - 80 Possible Alpha-Numeric Printed Characters with Machine Code

- ~~38~~ 48 Additional Machine Code Printed Characters Only

- ~~24~~ 25 Chip Printer Control Characters

Total Up To 152 Characters On Input Tape

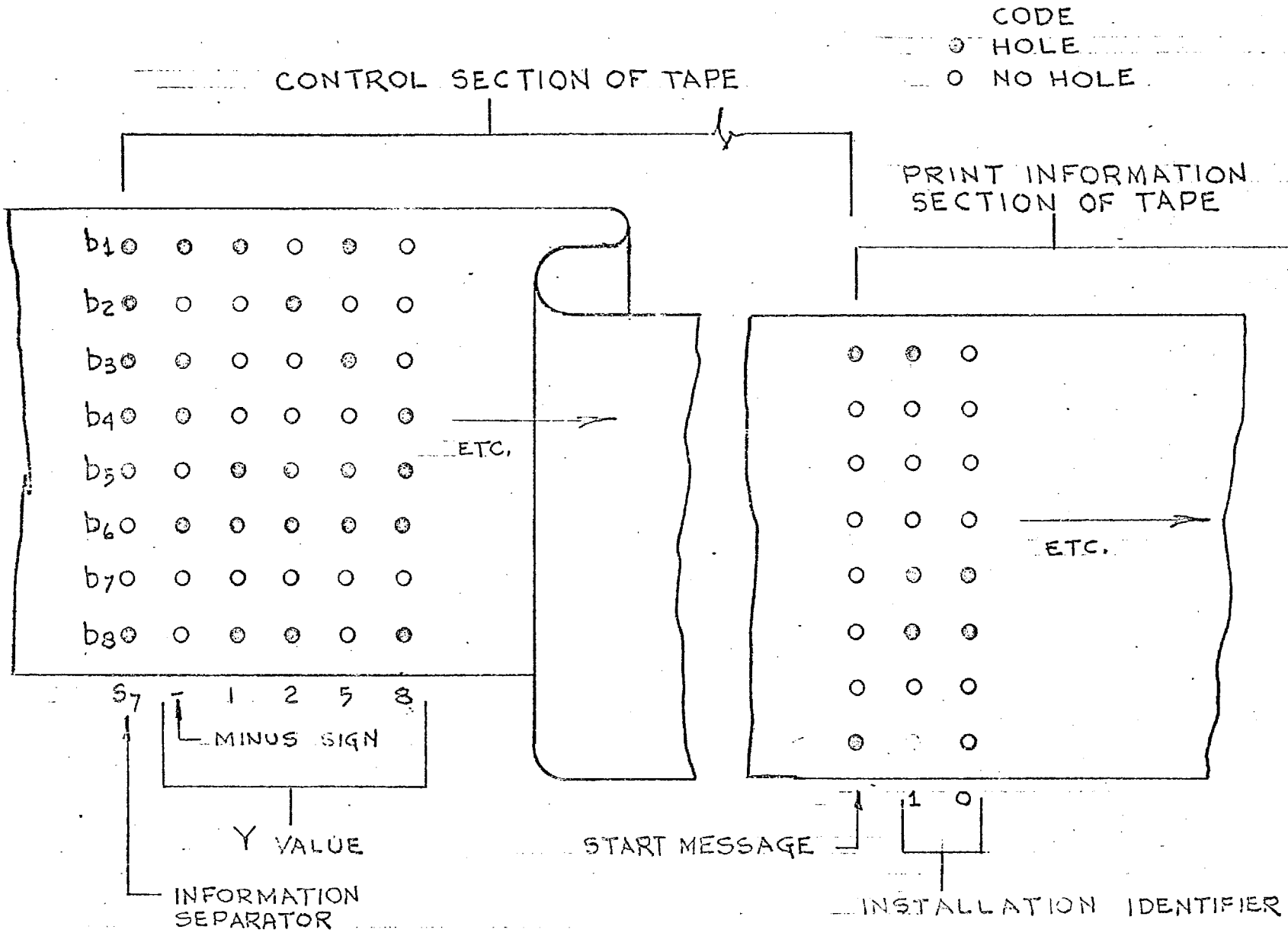
2.3.1.2 The ~~24~~ 25 Chip Printer Control characters shall be used to automatically position the printer raw stock relative to the input negative after indexing by the operator, to control the number of prints, and to automatically position the proper security classification that is to be printed on the output chip.

2.3.1.3 The first ~~24~~ 25 characters on the input tape shall be a fixed amount of control characters. The alpha-numeric "Print Information" section of the input tape will be started by a "Start Message" symbol and will be ended by the "End of Address" symbol. This section of the print information will not exceed 80 characters. The machine code "Print Information" section of the input tape will be started by a "Start Message" symbol and will be

ended by the second "MPC" parity check symbol. The machine code section of the input tape, which includes the 80 alpha-numeric part of the tape, will not exceed 128 characters. Both the alpha-numeric and the machine code sections can be made of shorter message length providing that the "End of Address" symbol follow the last alpha-numeric characters and the "End of Transmission" symbol follow the last machine code characters.

2.4 The Output Chip Format

2.4.1 In order to simplify the input circuitry of the chip printer and also to be able to present the accession number in any possible order, it is planned that the input tape be preceded by 24 control characters, then followed by the accession number. As stated in Section 2.3 (Input Information) of this report, these control characters will be used to determine the number of prints to be printed and the security classification to be used, and to automatically position the input film, but they will not be printed out on the output chip. The next up to 80 input characters



SAMPLE TAPE FORMAT

FIGURE -

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will be printed in both alpha-numeric and machine code onto the output chip. There will be provisions to allow an additional 38 machine code characters to be printed onto the output chip. The "End of Transmission" and the two "MPC" parity check characters will also be printed out onto the output chip.

2.4.2 The Output Chip Accession Generator.

Two outputs are to be produced by the output generator.

(a) Digital Display

(b) Alpha-numerical Characters.

(a) The Digital Display will be the standard eight level ~~A.S.A.~~ ASCII code plus a single time base pulse. ~~It will be generated by nine (9) individual hammers (keys) which will be energized directly from the input tape. This data can pass directly to the keys and then through a time delay circuit which would strike the hammers to print.~~ Amend II

(b) ~~The~~ Alpha-numerical Display will be generated by ~~utilization of a constantly~~ rotating font. When the proper character Amend II The Alpha-numerical display + the digital display will be generated by utilization of a constantly rotating font

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is in position, a hammer trips and prints out the required character.

Both of the above will be combined to produce a master negative. This master negative is then moved into the printing station and the appropriate exposure made onto the final chip by a high intensity flash. Repetitive prints are made by repetitive flashes at the correct time.

2.4.3 Control characters (output number 57 and 58) are a carriage return, line feed code that are introduced so that the hard copy print out can allow for these operations. If these symbols were not present, the hard copy print out will write on the automatic carriage return and print on the fly back of the typewriter cycle. ~~The symbols are left in the data code, in case the data is read from the chip onto a hard copy print out. If required, these two symbols can be removed from the data block, and two more machine code information characters can be placed into it by adding an "Information Separator" symbol into position number 83 of the input tape.~~

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2.5 Viewing Area

2.5.1 Provision shall be made for viewing the print area, prior to printing, to assure alignment of fiducial marks and rotation (azimuth). This shall be accomplished by moving the print magazine (mounted on rails) out of the printing area. An auxiliary 10 power viewer mounted on the print magazine shall be provided, giving a view of approximately 1/8 to 1/4 square inch of area on input material.

2.5.2 The operator may select either of two format sizes, before processing any input material, by use of removable masks at the print station and proper positioning of the print magazine (manual operation).

2.6 Print Copies

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2.6.1 The printer can produce an infinite number of repetitive prints by reloading magazines and restarting. However, operator selection of from one to ~~thirty-six~~ 34 copies is limited by the processing chip holder magazine, which has a capacity of ~~thirty-six~~ 34 holders. Upon actuation of the print cycle, the printer shall auto-

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matically sense the required exposure, advance and position the unexposed film chip at auxiliary data exposure station; print, transport, and position the film chip to the image station; print, and transport the film chip to the eject station; eject chip and load chip into chip holder; then load chip holder into chip magazine. This action will automatically continue, until the desired number of identical exposures have been made.

2.6.2 The output rate shall be six exposures per minute with a design objective of ten exposures per minute in the identical exposure mode.

2.6.3 The printer shall be capable of daylight operation except for loading of film chip cassette.

2.6.4 The size and capacity of the chip cassette capacity shall be based upon 500 raw film chips of .005 thickness.

2.7 Transport System

2.7.1 Provision shall be made to transport and print from single rolls of input materials, varying from 70 mm through 9-1/2 inches in width.

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2.7.2 The film transport and X mensuration drive shall drive and takeup in either direction, so that at completion of printing, the negative input roll is respooled in the same manner as received. The same requirement applies to the double roll mode, except that the two rolls may be transported in opposing directions simultaneously.

2.7.3 The film transport and X mensuration drive, when used as the X mensuration mode, shall position to an accuracy of better than .012 inch per 25 inches of travel when tested with .0054 ± .0003 inch thick film. (All mensuration is done in single roll mode.) Torque motors at each end shall drive and position the film and provide precise constant film tension. Sensor arms shall be of the balanced adjustable type (similar to phonograph) to hold contact pressure on the film to a minimum. No scratches or abrasion marks shall appear on the film. The base side of the film shall contact metering and guide rollers only.

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0.3048 mm

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2.7.4 The Y film transport and mensuration carriage shall position in the Y mensuration mode to within ~~.1 mm.~~ 0.2 mm

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2.7.5 Provision shall be made to position film transport X-Y carriage in azimuth ±180° to ~~1/10 of 1°~~ 0.2 degrees of accuracy.

2.7.6 A print station shall be provided with removable masks containing format mask, fiducials, and film alignment grid.

2.7.7 Film cleaning and static eliminator devices shall be provided, if found necessary.

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2.7.8 A film footage counter (add and subtract in ~~.1 of a foot~~ 0.2 ft) for each film channel shall be provided (four digit counter).

2.7.9 An adjustable X, Y mensuration system, accurate to ±1/2 mm over 25 inches, shall be provided. Both positive and true negative values are required.

2.7.10 A ~~six~~ 5-digit nonresettable counter will be provided for counting total lifetime operating hours of the machine. A ~~six~~ 5-digit nonresettable counter will also be provided to count total cycles of operation.

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2.7.11 A liquid gate will be provided, which will wet the film in the exposure area during exposure. Adequate air drying will be provided. Proper antitoxic vents will be supplied to meet with customer's venting system.

2.8 Automatic Exposure Control

2.8.1 An automatic exposure control system will be provided. Provision will be supplied for three varied forms of operation.

a. Normal: The automatic exposure control will sense the average exposure of approximately 1 square inch of the center of the format area.

b. Enlarged: The automatic exposure control will see only that area as displayed through the 10X enlarged optical system, or approximately ~~.200~~ 0.250 in diameter of an inch located at the center of the format.

Amend 11

c. Selective: Seven pushbuttons will be supplied to operate in conjunction with either (a) or (b) of above. Upon depressing the center button, normal exposure will be

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achieved. Three pushbuttons either side of normal may be depressed to vary the exposure in one-~~half~~ stop increments, or a total of ~~±1 1/2~~ 3 stops from normal.

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Note: Means will be provided so that the one-half stop increments may be varied to a full stop operation, or a total of ±3 stops from normal if desired. This will be an either/or proposition to be selected by the customer at a later date.

2.9 Resolution Considerations

2.9.1. The printer will be designed, based upon previous breadboard results with the capability of producing 400 l/mm from an adequate resolution input target of a 1000:1 contrast ratio.

2.9.2 This resolution requirement shall apply over the entire format area of each specification size.

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2.9.3 Present film emulsions which are now being considered for use with this program, exhibit an expanded tonal gray scale with lower resolution capabilities, than the originally anticipated film (now approximately 200 l/mm). The printer shall be capable of consistently producing exposures, when set at the normal exposure range and correctly developed to the film manufacturer's recommendations with a resultant resolution within 12% of the manufacturer's stated resolution. (12% based upon $6\sqrt{2}$ or a possible 1-target down variation from the film manufacturer's specification.) The above 1-target deviation is allowed due to human visual reading error and other known correlation factors which fail in standard resolution testing. $60\sqrt{2}$

2.9.4 Eastman Kodak has found an item they refer to as "Measles". Occasionally it appears present when discussing resolution of this magnitude. "Measles" is not at the moment understood and it appears to be random

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splotches of varying resolution across a format area. Eastman Kodak has stated that "Measles" may be due to emulsion coating problems and may be inherent in the emulsion itself. Therefore, the above resolution requirements do not apply if successive exposure produces random resolution variations which can be attributed to "Measles". This is a film manufacturer's problem which must be solved by them.

2.9.5 Although tonal gradation of correct reproduction of the gray scale is also important, this primarily is not a function of the printer as the illumination source will be balanced in the color temperature range required and little else can be done. However, by varying exposure (see exposure requirements) by individual steps and proper controlled development, some change in the Gamma slopes can be achieved on individual emulsions. Tonal gradation is not, however, a requirement of this specification.

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2.10 Frame and Housing Assembly

2.10.1 The frame and housing assembly shall contain all of the assemblies and components necessary for operation and shall maintain all parts in proper alignment to assure reliable and precise operation.

2.10.2 Isolation from and prevention of vibration harmful to optimum performance shall be accomplished by utilization of an air mounted vibration system.

2.10.3 All access panels and controls shall be equipped with suitable interlocks to prevent possible injury to personnel. Indicator displays will show various system readiness and/or malfunctions. The amount and placement of the above are to be by mutual consent of contractor and customer.

2.10.4 The printer shall be so constructed to fit through a normal 36-inch door, including mounting pads no longer than ~~105~~ 108 inches. Modular design shall be used

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wherever practical.

2.10.5 The printer design and fabrication shall exhibit the highest possible degree of human engineering consistent with the specified requirements.

2.11 Electrical Considerations

2.11.1 The printer shall be provided with circuit breakers to prevent damage in the event of electrical failure.

2.11.2 All wiring shall be color coded.

2.11.3 A block circuit diagram will be permanently affixed to an accessible interior panel. Individual circuit diagrams ~~cards~~ will be furnished and conveniently stored with the printer.

2.11.4 Input power shall be 208 volts, 60 cycles, 3 phases of connection.

2.11.5 Proper and adequate voltage stabilization shall be provided where required to assure consistent and stable operations.

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2.11.6 Electrical design shall be such that radio interference will be held to a minimum.

2.12 Splice Accommodations

2.12.1 The printer shall accommodate film rolls as input material with film splices of the type normally used by principal manufacturers of aerial film, as well as good quality hand splices, with the following exception: no print shall be made with the splice lying in the format area.

2.13 Newton Rings

Provision shall be made, if necessary, to prevent contact marking or Newton Rings from effecting the photographic quality of the output.

2.14. Film Handling

2.14.1 The printer shall not damage the film base or emulsion of the original, negative, or print material in any visual manner whatsoever, including damage that may be caused by static electricity.

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2.15 Dimensional Stability

2.15.1 There shall be no undue strain applied to the input negative film or print stock during the transport or print cycle.

2.15.2 A 4 by 5 cut film stock cut to the normal standard tolerances will be utilized as the output film.

2.16 Reliability

2.16.1 The printer shall be designed for a 90% duty cycle. The printer shall further operate satisfactorily and properly in all respects for a period of not less than ten (10) consecutive hours without malfunction or breakdown as part of pre-shipment test.

2.17 Service Life

2.17.1 The printer shall be designed to withstand operating service usage (normal operating conditions) for a period of 5,000 cumulative hours without degradation of performance. Only cleaning and minor maintenance due to the normal mortality of expendable replacement parts will be required.

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2.18 Light Source

2.18.1 The light source and optical system shall be designed to initiate the maximum latent image capability of the correct, highest quality silver-halide sensitized materials, respectively. It shall be of adequate but not excessive bandwidth to accommodate these materials.

2.18.2 Evenness illumination shall be a part of this requirement. There shall be no visible streaking whatever throughout the normal exposure area. Optical compensators or corrections to achieve even illumination shall be a consideration, provided there is no resultant degradation in quality resolution or acutance. Acceptance testing shall include standard flash printing exposed to a density between .1 to .3 to check and verify uniformity.

3 TEST PROVISIONS

3.1 Test Plan

3.1.1 The contractor shall prepare and submit to the Project

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Monitor for approval a detailed test plan approximately sixty (60) days prior to the completion of the ~~plan.~~ instrument. This test plan will be based upon the Acceptance Test specification and will determine conformance to this specification. ~~shall specify and describe in detail those tests to be conducted at the contractor's plant to determine conformance with this specification requirement.~~ The Project Monitor reserves the right to modify ~~or to amplify~~ the test plan to assure complete ~~and adequate~~ testing in conformance with the Acceptance Test specification. ~~within the limitations of this specification~~.

3.2 Test Materials and Equipment

3.2.1 The contractor shall provide test targets on a test film and test instruments to adequately demonstrate fulfillment of performance requirements. With the exception of the state-of-the-art requirements which are not available by standard procurement, all test materials and equipment shall be detailed in the submitted test plan for approval.

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3.3 Pre-shipment Test

3.3.1 Testing, as set forth in the approved test plan, shall be conducted by the contractor at his facility under the direction of the Project Monitor.

3.3.1.1 A detailed report of the tests performed and their results shall be delivered within thirty (30) days after the printer delivery.

3.3.1.2 A daily log on operation and performance of the printer shall be maintained, commencing at the time pre-shipment test begins. This log shall detail operation hours, down time, cause of down time, fixes, et cetera, and shall be of a permanent type, affixed to or accompanying the printer at all times.

3.3.2 Approval of pre-shipment test results shall not constitute final acceptance.

3.4 Acceptance Test

3.4.1 Acceptance test shall be performed at the delivery destination and will include, in addition to any or all tests detailed in the test plan, a 30-day normal operational period under pro-

duction conditions.

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4 TRAINING

4.1 Contractor's Facility Training

A comprehensive training period shall be conducted by contractor personnel at the contractor's facility for six (6) government personnel. This training shall include, but not be limited to, theory of operation, practical operation, maintenance, and trouble-shooting and shall encompass optical, mechanical, and electronic applications.

4.2 Destination Training

4.2.1 The contractor shall designate one engineer, who is thoroughly acquainted with all of the operational aspects of the printer, to remain at the delivery destination for the duration of the acceptance testing. Operational training will be a part of his duties. The above period not to exceed thirty (30) days under this contract.

5 SPARE PARTS

5.1 A recommended spare parts list shall be submitted by the contractor sixty (60) days prior to delivery or sooner. Vendors,

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pricing of components, and a recommended six (6) month stock level shall be included. It shall be the prerogative of the Project Monitor to use it as a shopping list for contractor procurement of approved items.

6 DRAWINGS

6.1 Manufacturing Drawings

6.1.1 A set of ~~manufacturing~~ drawings, ~~along with wiring schematics and including a drawing index and a complete list of parts, shall be furnished as an end item.~~ consisting only of master assembly drawings, wiring schematics and a drawing index shall be furnished as an end item. These drawings shall conform to good commercial practices.

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7 MANUALS

7.1 Operational and Maintenance Manual

Ten (10) copies of operational and maintenance manuals shall be provided. The manual shall describe all operational characteristics and normal maintenance and repair procedures.

8 DELIVERY

8.1 Delivery shall be as specified in the procurement document.

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PATENT NOTICE:

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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9 LIST OF CHANGES OF SCOPE

9.1 The following is a list of those items which have been expanded from the original specification and are considered extra scope items over and above the initial contract.

9.1.1 A change in the proposed location of the auxiliary information (across the narrow edge of the film chip) to placement along the longer edge of the film chip with the security classification printed on the narrow ends.

9.1.2 Development of a method of roll film tension control that eliminates the use of sensor arms that could cause film damage.

9.1.3 Development of film metering system wherein no roller touches the face of the emulsion.

9.1.4 An expanded amount of digital display information to be printed on the final chip. Originally 56, now expanded to 80 characters on the long dimension of the film and up to 128 digital displays.

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9.1.5 The addition of a 10 power magnified image of the center of the format.

9.1.6 The addition of an auxiliary exposure control to work with the above magnified system.

9.1.7 Increasing the number of repetitive prints from the original 15 to a total of 99 (this now is limited to a total of 36 due to the fact that this is the capacity of the processing magazine). However, an indefinite number may be produced by reloading magazines.

9.1.8 Change of the original 10 security classifications so that the unit can be eventually adapted to a total of 99.

9.1.9 Addition of loading of film chip into chip holder and chip holder into chip processing magazine.

9.1.10 Check parity in both longitude and transverse direction. Parity was not considered as part of the original proposal.

9.1.11 Change of the original 33 teletype to the 35 ASR teletype.